

REMARKS

I. Introduction

In response to the pending final Office Action, Applicants have amended claim 1 and added new claims 9-15 to further clarify the subject matter of the present disclosure. Claims 2-4 have been cancelled, without prejudice. Support for the amendment to claim 1 and for new claims 9-15 may be found, for example, in paragraphs [0026], [0038] and Table 1 of the specification. No new matter has been added.

A Request for Continued Examination (RCE) is being filed concurrently with this Amendment.

For the reasons set forth below, Applicants respectfully submit that all pending claims are patentable over the cited prior art references.

II. The Rejection Of Claims 1-8 Under 35 U.S.C. § 103

Claims 1-8 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Yonemura (JP 2003-346888) in view of Ohba et al. (USP No. 5,989,750). Applicants respectfully traverse the pending rejection for at least the following reasons.

With regard to the present disclosure, independent claim 1 recites, in-part, a lead storage battery including: a positive electrode grid, a negative electrode grid, a positive electrode connecting member, and a negative electrode connecting member comprising a Pb-alloy including at least one of Ca and Sn. The Pb-alloy in the negative electrode grid and the negative electrode connecting member do not include Sb, or contains Sb in an amount of less than 0.0001% by mass as an impurity; and the Pb alloy in the positive electrode grid and the positive

electrode connecting member does not include Sb, or contains Sb in an amount of 0.001 to 0.002% by mass as an impurity. The separator comprises a microporous synthetic resin sheet and silica particles dispersed in the synthetic resin sheet, and includes 35 to 85% by mass of said silica particles. A part of the negative electrode grid excluding the tab includes 0.0002 to 0.006 parts by mass of the Sb per 100 parts by mass of the negative electrode active material.

Features of the present disclosure include a lead storage battery that includes both a negative electrode grid which includes 0.0002 to 0.006 parts by mass of the Sb per 100 parts by mass of the negative electrode active material (not including the tab), and a separator which includes 35 to 85% by mass of silica. As a result of this combination, the corrosion at the tab of the negative electrode is significantly suppressed and the service life of the battery is remarkably improved in the usage mode in which charge and discharge are frequently repeated under a low SOC range.

It is admitted in the Office Action that Yonemura fails to disclose a separator that includes silica. Ohba is relied on as curing this deficiency of Yonemura. Furthermore, in the Response to Arguments section of the Office Action, the Examiner alleges that Yonemura does suggest the unexpected results obtained by batteries of the present disclosure. Applicants respectfully disagree.

Yonemura shows, in Tests 1 and 2 of the Example, life tests conducted under overcharge conditions. This is in contrast to the present disclosure which is intended for a usage mode in which charge and discharge are frequently repeated at low SOC. Moreover, Yonemura intends to solve the problem of corrosion of the tab occurring when the electrolyte decreases due to overcharge in which the tab is exposed from the decreased level of electrolyte. In contrast, the

present disclosure is directed toward preventing corrosion of the tab immersed in the electrolyte during use.

Moreover, as is shown in Table 1 of the present disclosure, unexpected and superior results are shown for batteries having the above-mentioned combination. Yonemura teaches a Sb content of from 0.001 to 0.1 mass % and no silica (see, paragraph [0014]). However, the present disclosure exhibits a far smaller range of Sb (0.0002 to 0.006 mass %). This range is significant. Batteries B4 and L4 are shown having suppressed corrosion in a life test in which charge and discharge are frequently repeated at low SOC. For example, in battery B4 corresponding to one embodiment of the present disclosure, which has silica content of 35% and Sb content of 0.006%, the corrosion at the tab of the negative electrode grid is significantly suppressed (3.4%) and the service life is remarkably improved (75,200 cycles).

In contrast, batteries outside the range which correspond to batteries of the cited prior art do not exhibit superior characteristics. For example, battery A4 (silica content 35%, 0% Sb – corresponds to Yonemura) has a corrosion rate of 82.5% and a cycle life of 25,100 cycles (see Table 1 of specification). While the cited prior art batteries may prevent corrosion from decreased electrolyte, they do not prevent corrosion from the immersion in electrolyte in usage mode. Other plentiful examples are batteries B2-B4, C2-C4, D2-D4 and E2-E4 which correspond to the new ranges of amended independent claim 1. These batteries all show unexpected results over the batteries in Tables 2 and 4, as these comparative examples use a Pb-alloy containing 2.5% Sb in the positive and negative electrode connecting members. Further, in batteries B5, C5, D5, E5, L5, M5, N5 and O5, which all have an Sb content of 0.007 parts by mass, the corrosion rate is comparatively high compared to the batteries within the claimed range.

As such, it is clear that the proposed combination of references fails to predict or suggest the unexpected results obtained from the claimed disclosure. Accordingly, it is clear that Yonemura and Ohba do not render independent claim 1 of the present disclosure obvious.

III. All Dependent Claims Are Allowable Because The Independent Claim From Which They Depend Is Allowable

Under Federal Circuit guidelines, a dependent claim is nonobvious if the independent claim upon which it depends is allowable because all the limitations of the independent claim are contained in the dependent claims, *Hartness International Inc. v. Simplimatic Engineering Co.*, 819 F.2d at 1100, 1108 (Fed. Cir. 1987). Accordingly, as claim 1 is patentable for the reasons set forth above, it is respectfully submitted that all pending dependent claims are also in condition for allowance.

Moreover, as new independent claim 12 contains similarly unexpected results from batteries L2-L4, M2-M4, N2-N4 and O2-O4 shown in Table 3, Applicants submit that claim 12 is allowable over the cited prior art as well.

IV. Rejection Of Claims 1-4 and 8 Under Nonstatutory Double Patenting Doctrine

Claims 1-4 and 8 stand rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-4 and 6 of copending U.S. Application No. 10/585,078 in view of Yonemura.

However, since this rejection is provisional, Applicants respectfully request that the rejection be withdrawn until such time as claims in either application have been indicated to be allowable. As claims are often amended during prosecution, it is possible that the claims

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determined to be allowable may be patentably distinct from one another. According to PAIR, as of today January 5, 2010, the claims of Application No. 10/587,187 have yet to be allowed.

V. Conclusion

Having responded to all open issues set forth in the Office Action, it is respectfully submitted that all claims are in condition for allowance.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

McDERMOTT WILL & EMERY LLP

Bernard P. Gadd (Reg. No. 46,429)
for

Michael E. Fogarty
Registration No. 36,139

600 13th Street, N.W.
Washington, DC 20005-3096
Phone: 202.756.8000 MEF/BPC/NDM:kap
Facsimile: 202.756.8087
Date: January 5, 2010

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as our correspondence address.**